LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA19 | Coleshill Junction

Data appendix (AG-001-019)

Agriculture, forestry and soils

November 2013

VOL 5

ES 3.5.2.19.1

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Appendix AG-001-019

Environmental topic:	Agriculture, forestry and soils	AG
Appendix name:	Agricultural data appendix	001
Community forum area:	Coleshill Junction	019

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1 Introduction

1.1.1 The agriculture, forestry and soils appendices for the Coleshill Junction community forum area (CFA19) comprise:

- Soils and agricultural land classification surveys (Section 2);
- Forestry (Section 3); and
- Farm impact assessment summaries (Section 4).

1.1.2 Maps referred to throughout the agriculture, forestry and soils appendix are contained in the Volume 5 agriculture, forestry and soils map book.

2 Soils and agricultural land classification surveys

2.1 Background

2.1.1 The soils and agricultural baseline conditions reported have been established from desktop studies and site surveys.

2.1.2 Information gathered by desktop studies has related primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:

- National Soil Map[1];
- Soils and Their Use in Midland and Western England[2];
- Solid and superficial deposits from the Geology of Britain viewer[3];
- Gridpoint meteorological data for Agricultural Land Classification of England and Wales[4];
- Provisional Agricultural Land Classification of England and Wales (1:250,000)[5];
- Likelihood of Best and Most Versatile Agricultural Land (1:250,000)[6];
- Agri-environment schemes[7];
- Aerial photography from Google Earth; and
- On-site soil and Agricultural Land Classification surveys.

2.1.3 Information gathered by field survey[8] has related to the enhancement of desk-based information on soils and agricultural land quality, and the engagement with landowners and tenants to establish the nature and extent of agricultural, forestry and related rural enterprises.

2.1.4 Field and other data were interpreted using the MAFF's 1988 Revised Guidelines and Criteria for Grading the Quality of Agricultural Land[9].

2.1.5 Information obtained from farm impact assessment interview surveys has been taken as a factual representation of local agricultural and forestry interests and has not been subject to further evaluation.

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[1] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.
[2] Soil Survey of England and Wales (1984), *Soils and Their Use in Midland and Western England*. Harpenden.
[3] British Geological Survey. http://bgs.ac.uk/geologyofbritain/home/html.
[4] Meteorological Office (1989), Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations.
[5] Ministry of Agriculture, Fisheries and Food (1983), Agricultural Land Classification of England and Wales (1:250,000).
[6] Department for Environment, Food and Rural Affairs (2005), Likelihood of Best and Most Versatile Agricultural Land (1:250,000).
[7] Multi-Agency Geographical Information for the Countryside (MAGIC) available on line @ www.magic.gov.uk.
[8] Hodgson, J.M. (1997), *The Soil Survey Field Handbook*. Soil Survey Technical Monograph no. 5, Silsoe.
[9] Ministry of Agriculture, Fisheries and Food (1988), Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land.

2.2 Soils and land resources

2.2.1 This part of the technical appendix describes the findings of a desktop study and targeted soil survey and Agricultural Land Classification (ALC) survey that identified existing soil and agricultural land resources in the study area.

2.2.2 The location and extent of different soil types and agricultural land in the different ALC grades are influenced by topography and drainage, and by geology and soil parent materials, which are described in turn in the following sections. This section then provides a description and distribution of the main soil types encountered along the study corridor.

Topography and drainage

2.2.3 The study area is largely urban. The River Tame flows from the west through Birmingham then turns and continues northwards to Tamworth and the Trent. The River Cole enters the arterial drainage system from the south-west and passes through Coleshill, crossing the valley in broad meanders, while the River Blythe drains the Arden region in the south. The 300m to 600m wide floodplains of the rivers are at 75m above Ordnance Datum (AOD), while the interfluves reach 75m to 100m AOD.

Geology and soil parent materials

2.2.4 Superficial Deposits intermittently underlie the areas traversed by the north chord and Birmingham spur lines, as well as the main line. The Proposed Scheme will pass through the following:

- granular material in the form of Glaciofluvial Deposits, which is generally present in areas of higher elevation with River Terrace Deposits occupying the river valley formed by the meandering course of the River Cole;
- Glaciolacustrine deposits, comprising predominantly cohesive material, which are present predominantly in areas of higher elevation; and Alluvium, comprising clay, silt, sand and gravel, which is present on the floodplain of the River Cole; and
- Head Deposits, comprising clay, silt, sand and gravel resulting from downslope movement, which are present around Green Lane and at the western end of the Birmingham spur.

2.2.5 Bedrock of the Mercia Mudstone Group underlies the whole of the Proposed Scheme in the study area. The Mercia Mudstone Group is described as red and green-grey, mudstones and subordinate siltstones with widespread thin beds of gypsum/anhydrite. Intermittent layers of sandstone are also present within the Mercia Mudstone, including the Arden Sandstone that outcrops towards the south of the study area.

2.2.6 A list of geological strata occurring within the study area is provided in age order in Table 1and shown on Map WR-02-019 (Volume 5).

Table 1: Bedrock and soil forming materials

Formation	Composition/soil parent material
Superficial deposits	
Alluvium	Clay, silt, sand and gravel
Head	Clay, silt, sand and gravel
Glaciofluvial Deposits	Devensian sand and gravel
Glaciolacustrine Deposits	Clay and silt
River Terrace Deposits	Sand and gravel
Bedrock	
Mercia Mudstone Group-Mudstone	Mudstones and subordinate siltstones

Description and distribution of soil types

2.2.7 The characteristics of the soils are described by the Soil Survey of England and Wales[10] that accompanies the National Soil Map[11]. The soils are grouped into soil associations of a range of soil types (soil series) and are summarised in Table 2, and their distribution is shown on Map AG-02-19.

Table 2: Soil associations

Soil association: code shown on Map AG-02-19	Soil association: name	Description	Wetness class
543	Arrow	Deep permeable light loamy soils affected by groundwater	I-III
711b	Brockhurst 1	Slowly permeable seasonally waterlogged reddish medium loamy over clayey, with some similar soils with slowly permeable subsoils and slight seasonal waterlogging	III
813a	Midelney	Stoneless clayey soils mostly overlying peat, variably affected by groundwater. Some similar soils with clay loam textures	III-IV
813b	Fladbury 1	Stoneless clayey soils, variably affected by groundwater. Some similar soils with clay loam textures	III-IV

2.2.8 The National Soil Map shows three principal soil types within this community forum area:

- the Arrow Association is mapped on the river terrace and glaciofluvial deposits; the dominant soil type has deep permeable light loams variably affected by groundwater with sands and gravels at depth; they experience slight seasonal waterlogging (Wetness Class II (WC II)) with lower areas of more prolonged waterlogging (WC III)[12], but are potentially well drained (WC I) where they respond to drainage with suitable outfalls;
- much of the land contained within the junction 'triangle' and to its west has

[10] Soil Survey of England and Wales (1984), Soils and their Use in Midland and Western England, Bulletin 12.
[11] Cranfield University (2001), The National Soil Map of England and Wales 1:250,000 scale. National Soil Resources Institute, Cranfield University, UK.
[12] The Wetness Class (WC) of a soil is classified in Appendix II of Hodgson, J.M. (1977) The Soil Survey Field Handbook. Soil Survey and Land Research Centre, Technical Monograph No.5, according to the depth and duration of waterlogging in the soil profile and has six bands ranging from Wetness Class I (well drained) to Wetness Class VI (permanently waterlogged).

soils of the Brockhurst 1 Association developed on mudstones and glaciolacustrine deposits; topsoils and upper subsoils tend to be medium loamy or medium silty, but the slowly permeable clayey lower subsoils cause the dominant soils to be seasonally waterlogged (WC III); and

- alluvial soils on the floodplains are mapped as Midelney and Fladbury 1 associations which comprise mainly stoneless clays and silty clays overlying peat in places in the Midelney association; they are affected by groundwater and can be wet for long periods (WC III – IV). In this CFA both associations were found to contain frequent inclusions of clay loam textured alluvium.

2.3 Agricultural land quality

2.3.1 A review of available ALC information has been undertaken to ascertain the land quality within the study area. The review also sought to identify the extent of existing detailed post-1988 ALC information to ensure that surveys are not repeated unnecessarily. Detailed surveys made for Gilson and Wheeley Moor farms are available from the MAGIC website[13]. These show a predominance of Subgrade 3b mixed with Subgrade 3a, and some Grade 2.

2.3.2 In areas where access to land was not granted to access sites, ALC has been assessed from available information in the form of archived Soil Survey records obtained from the National Soil Resources Institute (NSRI) at Cranfield University. In areas where land access was not granted and no archived records were available, a professional judgement was made using published soil maps geological information.

Detailed agricultural land classification

2.3.3 A total of 67 soil auger bores were made in CFA19 in the land affected by HS2. In addition, four archived bores were obtained from NSRI, bringing the total number of auger records to 71.

2.3.4 Farms where soil surveys were undertaken for HS2 in 2012 and 2013 are: CFA19/2 Windmill Farm, CFA19/3 Land around Coleshill Manor, CFA19-7 Land adjacent to Gilson, CFA19/8 Newlands Farm, CFA19/9 Gilson Hall and CFA19/11 Land at Water Orton.

2.3.5 The principal physical factors influencing agricultural production and land quality are climate, site and soil, and the interactions between them.

2.3.6 Soil profiles were examined using an Edelman (Dutch) auger and a spade. Where soils were stony or dry a 2.5 cm diameter screw auger was used to enable deeper penetration. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm where possible, or to any impenetrable layer:

- soil texture;
- significant stoniness;
- colour (including local gley and mottle colours);

[13] Multi-Agency Geographical Information for the Countryside (MAGIC) available on line @ www.magic.gov.uk.

- consistency;
- structural condition;
- free carbonate; and
- depth.

2.3.7 Soil available water capacity, relevant to the assessment of drought risk, was estimated from texture, structure, organic matter content, stone content and profile depth.

Agro-climatic limitations

2.3.8 The local climatic factors have been interpolated from the Meteorological Office's database (Met Office 1989) held in the Landis climatic database at Cranfield University[14] at 1km intervals along the line of the track. The average of the parameters is given in Table 3. There is little variation across the CFA: FCDs are within the narrow range 153 to 158 days; average annual rainfall (AAR) is from 661mm to 676mm; moisture deficits are 99mm to 100mm for wheat and 89mm to 90mm for potatoes.

Table 3: Interpolated agro-climatic data

Climatic parameter	**M6 (SP1924 8764)**	**B4114 (SP1903 8850)**	**Water Orton (SP1689 9063)**
Altitude (m)	85	85	90
Average annual rainfall (mm)	666	661	676
Accumulated Temperature >0°C (Jan-June)	1388	1395	1381
Field Capacity Days (days)	154	153	158
Average Moisture Deficit, wheat (mm)	99	100	98
Average Moisture Deficit, potatoes (mm)	89	90	87

2.3.9 Climate itself does not place any limitation upon the land in this part of the West Midlands, but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the soil.

2.3.10 The influence of climate on soil wetness is assessed by reference to median Field Capacity Days (FCD) when the soil moisture deficit is zero, soil wetness class (WC) and topsoil texture (MAFF 1988 Table 6). Soil WC was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick.

2.3.11 The ALC grade according to soil wetness was determined by following the methodology set out in the ALC Guidelines (October, 1988) and the information in the Table 4 below.

[14] http://archive.defra.gov.uk/foodfarm/landmanage/land-use/documents/alc-guidelines-1988.pdf Accessed Aug 2103.

Table 4: ALC grade according to soil wetness – mineral soils (based on Table 6 of ALC Guidelines, October 1988)

Wetness class	Texture[1] of the top 25 cm	Field capacity days				
		<126	126-150	151-175	176-225	>225
I	S[2] LS[3] SL SZL	1	1	1	1	2
	ZL MZCL MCL SCL	1	1	1	2	3a
	HZCL HCL	2	2	2	3a	3b
	SC ZC C	3a(2)	3a(2)	3a	3b	3b
II	S[2] LS[3] SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a(2)	3a(2)	3a	3a	3b
	SC ZC C	3a(2)	3b(3a)	3b	3b	3b
III	S[2] LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a(2)	3a(2)	3a	3a	3b
	HZCL HCL	3b(3a)	3b(3a)	3b	3b	4
	SC ZC C	3b(3a)	3b(3a)	3b	4	4
IV	S[2] LS SL SZL	3a	3a	3a	3b	3b
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5
Soils in Wetness Class VI – Grade 5						

Texture key: S – sand; LS – loamy sand; SL – sandy loam; SZL – sandy silt loam; ZL – silt loam; MZCL – medium silty clay loam; MCL – medium clay loam; SCL – sandy clay loam; HZCL – heavy silty clay loam; HCL – heavy clay loam; SC – sandy clay; ZC – silty clay; C – clay

[1] For naturally calcareous soils with more than 1% $CaCO_3$ and between 18% and 50% clay in the top 25 cm, the grade, where different from that of other soils, is shown in brackets.

[2] Sand is not eligible for Grades 1, 2 or 3a.

[3] Loamy sand is not eligible for Grade 1.

2.3.12 Droughtiness is determined by comparing crop-adjusted available water (AP), with the moisture deficit (MD) for the locality for wheat and potatoes (MAFF 1988 Appendix 4). Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs. The availability of irrigation can improve grading by 1 division where appropriate. However, irrigation is not common practice for grass cereals and oil seed rape (OSR). The calculation used in the ALC Guidelines (October, 1988)[9] to determine the severity of this limitation is given below in Figure 1.

Figure 1: Methodology for calculating the severity of a droughtiness limitation to ALC grading (derived from MAFF, 1988)

$$\text{AP wheat (mm)} = \frac{TA_{vt} \times LT_t + \Sigma (TA_{vs} \times LT_{50}) + \Sigma (EA_{vs} \times LT_{50\text{-}120})}{10}$$

where

TA_{vt} is Total available water (TA_v) for the topsoil texture

TA_{vs} is Total available water (TA_v) for each subsoil layer

EA_{vs} is Easily available water (EA_v) for each subsoil layer

LT_t is thickness (cm) of topsoil layer

LT_{50} is thickness (cm) of each subsoil layer to 50 cm depth

$LT_{50\text{-}120}$ is thickness (cm) of each subsoil layer between 50 and 120 cm depth

Σ means 'sum of'.

$$\text{AP potatoes (mm)} = \frac{TA_{vt} \times LT_t + \Sigma (TA_{vs} \times LT_{70})}{10}$$

where

LT_{70} is thickness (cm) of each subsoil layer to 70 cm depth

MB (Wheat) = **AP** (Wheat) **- MD** (Wheat)
MB (Potatoes) = **AP** (Potatoes) **- MD** (Potatoes)

Where
MB is the Moisture Balance
AP is the Crop-adjusted available water capacity
MD is the moisture deficit, as determined by the agro-climatic assessment.

Table 8 Grade according to droughtiness

Grade/ Subgrade	Moisture Balance limits (mm) *wheat*		*potatoes*
1	+30	*and*	+10
2	+5	*and*	-10
3a	-20	*and*	-30
3b	-50	*and*	-55
4	<-50	*or*	<-55

Site limitations

2.3.13 The assessment of site limitations is primarily concerned with the way in which topography influences the use of agricultural machinery and hence the cropping potential of land. Gradient and microrelief[15] are not considered limiting in this CFA. Flooding in the study area is limited to the floodplains of the Rivers Cole and Tame. This is a potential limitation but its incidence is difficult to ascertain. Flood risk is determined by the extent, duration, frequency and timing of flooding events which may not have been recorded. The published flood maps by the Environment Agency can be used as a guide (see Figure WR-05-17, Volume 5) and the annual flood risk is not considered sufficient to be a limiting to agricultural land quality in this CFA.

Soil limitations

2.3.14 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops and soil drainage, workability and trafficability. The main soil characteristics within the area are sandy loam textures, in some places stony, over sand and gravel on river terraces and glaciofluvial sands and gravels. Poor structure in slowly permeable subsoils is a limitation on mudstones, and clay and clay loam textured slowly permeable soils on floodplains. Limitations imposed by soil depth and chemistry are not encountered in this CFA.

Interactive limitations

2.3.15 The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and erosion. Each soil can be allocated a Wetness Class (WC) based on soil structure, evidence and depth of waterlogging and the number of Field Capacity Days; where soil droughtiness is not a problem the topsoil texture and stone content then determines its ALC Grade. Thus, where there are 153 to 158 FCDs, then a typical soil in the Brockhurst 1 association with a Wetness Class of III will be Subgrade 3a if the topsoil texture is a medium clay loam, and Subgrade 3b if it is a heavy clay loam.

2.3.16 Soil texture and structure determine the available water capacity of the soil profile. When calculated against the demands of a growing wheat and potato crop in the locality given by the climatic variable, the moisture deficit, a moisture balance is produced, from which a droughtiness limitation can be assessed. The clay loam over clay soils of the Brockhurst 1 association have sufficient moisture reserves in an average year to have no droughtiness limitation, or only one that limits the land to Grade 2. Sandy loam soils of the Arrow association, however, tend to have a smaller available water capacity and will be no better than Grade 2; where stoniness and subsoils of sand and gravel occur, these soils will be limited to Subgrade 3a.

2.3.17 Grade 2 land occurs on some of the sandy loam soils of Arrow association where the soils are thicker over gravels and the droughtiness limitation due to a moderately small available water capacity is less severe.

15 Complex changes of slope angle and direction over short distances or the presence of boulders or rock outcrops, even on level or gentle slopes, which can severely limit the use of agricultural machinery.

2.3.18 Other sandy loams within the Arrow association which are shallower over sands and gravels, or have stony topsoils, or have a wetness limitation due to groundwater, are classed as Subgrade 3a. In the Brockhurst 1 association, soils have a slowly permeable subsoil. Where this occurs below 42 cm depth and where soil wetness is accompanied by medium clay loam topsoil textures, the land is classed as Subgrade 3a. These features become the main limitation restricting the range of crops.

2.3.19 For the seasonally waterlogged soils of parts of the Brockhurst 1, Fladbury 1 and Midelney associations, where the slowly permeable layer is at shallow depth and/or the topsoil texture is a heavy clay loam or clay, the wetness/texture limitation is more restrictive and the safe working period shorter, the land is classed as Subgrade 3b.

Summary of ALC assessment in CFA19

2.3.20 The characteristics of the soil series encountered within each association and a summary of the key characteristics relevant to the ALC grading in CFA19 are given in Table 5 to Table 8.

Table 5: Arrow association (543)

Deep permeable seasonally waterlogged sandy loam soils affected by groundwater.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 158 min 153)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Arrow		Glaciofluvial sands and gravels and river terrace	156	II	99 (125-100)	89 (85-75)	2 or 3a*	Droughtiness
	Quorndon	Glaciofluvial sands and gravels and river terrace	156	II-III	99 (125-100)	89 (85-75)	2 or 3a*	Droughtiness. Topsoil texture and wetness class locally
	Wick**	Glaciofluvial sands and gravels and river terrace	156	I	99 (125-100)	89 (85-75)	2 or 3a*	Droughtiness

* Where subsoil texture is loamy sand and or stone content is moderate to high then grade is restricted to 3a by drought.
** Wick series is a localised inclusion in this association particularly on crests and slopes.

Brief soil profile descriptions

Arrow	Quorndon	Wick
0-25cm Ap: Dark brown, slightly stony sandy loam 25-50cm Bw: Dark yellowish brown, slightly to moderately stony sandy loam; weak medium subangular blocky structure 50-80cm Bwg: Brown, slightly mottled, slightly or moderately stony sandy loam or loamy sand; weak coarse subangular blocky structure 80-120cm BCg: Brownish yellow, mottled, slightly or moderately stony loamy sand or sandy loam; single grain structure	0-25cm Ap: Dark brown, slightly stony sandy loam 25-50cm Bg1: Yellowish brown, mottled, slightly to moderately stony; weak medium subangular blocky structure 50-80cm Bg2: Yellowish brown, mottled, slightly to moderately stony weak coarse subangular blocky or single grain structure 80-120cm Cg: Pale to yellowish brown, mottled slightly to moderately stony loamy sand or sandy loam; single grain structure	0-25cm Ap: Dark brown, slightly stony sandy loam 25-50cm Bw1: Dark yellowish brown, slightly to moderately stony sandy loam; moderate to weak medium subangular blocky structure 50-80cm Bw2: Yellowish brown slightly or moderately stony sandy loam or loamy sand; weak medium angular blocky structure or single grain 80-120cm Cu: Brownish yellow, slightly or moderately stony loamy sand or sandy loam; single grain structure

Table 6: Brockhurst 1 association (711b)

Slowly permeable seasonally waterlogged reddish loamy over clayey soils. Some similar soils with slowly permeable subsoils and slight seasonal waterlogging.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 158 min 153)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Brockhurst		Mercian Mudstone Group	156	III	99 (120)	89 (105)	3a or 3b*	Topsoil texture and wetness class
	Salop	Till, Glaciolacustrine	156	III	99 (115)	89 (105)	3a or 3b*	Topsoil texture and wetness class
	Whimple	Mercian Mudstone Group	156	III	99 (115)	89 (105)	3a	Topsoil texture and wetness class

* Where Subgrade is 3b the topsoil texture is heavy clay loam.

Brief soil profile descriptions

Brockhurst	Salop	Whimple
0-20cm Ap: Dark brown very slightly stony medium clay loam 20-40cm Eg: Brown, mottled slightly stony medium clay loam; moderate medium subangular blocky structure 40-75cm Btg: Reddish brown, mottled stoneless or very slightly stony clay; strong coarse prismatic structure 75-100cm BCtg: Reddish brown mottled stoneless clay moderate coarse prismatic structure At 100cm: Reddish mudstone	0-25cm Ap: Very dark greyish brown slightly stony medium or heavy clay loam 25-45cm Eg: Brownish grey, mottled, slightly stony clay loam; moderate medium subangular blocky structure 45-100 Btg: Yellowish red, mottled, slightly stony; moderate to weak coarse prismatic structure 100-120cm BCtg: Reddish brown, mottled, slightly stony clay; massive structure	0-25cm Ap: Dark brown slightly stony medium clay loam 25-40cm Eb(g): Reddish brown, slightly mottled, slightly stony clay loam; moderate medium subangular blocky structure 40-60cm Bt(g): Reddish brown, slightly mottled, slightly stony clay loam; moderate to coarse prismatic structure 60-100cm 2BCtg: Reddish brown, mottled, stoneless clay; Coarse prismatic structure At 100cm: Reddish mudstone

Table 7: Midelney association (813a)

Stoneless clayey and clay loam soils often overlying peat and variably affected by groundwater. Flat land with risk of flooding.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 158 min 153)	Wetness class	Average moisture deficit and (available water) (mm)		ALC grade	ALC determinants
					Wheat	Potatoes		
Midelney		River alluvium	156	III**	99 (130)	89 (110)	3b	Topsoil texture and wetness class
	Fladbury	River alluvium	156	III**	99 (130)	89 (110)	3b	Topsoil texture and wetness class
	Blithe*	River alluvium	156	III	99 (120)	89 (100)	3a	Topsoil texture and wetness class

* Blithe series of loamy alluvium over gravel is a localised inclusion in this association and found to be common on floodplains within the CFA.
** Locally WC IV.

Brief soil profile descriptions

Midelney	Fladbury	Blithe
0-15cm Ahg: Dark greyish brown, mottled, stoneless clay 15-65cm Bg: Dark grey, mottled stoneless clay; strong coarse prismatic structure 65-120cm Oh: Dark reddish brown stoneless humified peat; massive structure	0-15cm Ahg: Dark greyish brown, mottled, stoneless clay 15-60cm Bg: Greyish brown, mottled, stoneless clay; strong coarse prismatic structure 60-120cm Cg: Grey, mottled, stoneless clay; massive structure	0-15cm Ahg: Dark greyish brown, mottled, stoneless medium clay loam 15-60cm Bg: Greyish brown, mottled, stoneless medium clay loam; strong coarse prismatic structure 60-80cm Cg: Grey, mottled, stoneless clay loam; massive structure 80-120cm 2Cg: Brown or greyish brown, mottled, gravely loamy sand or sandy loam; single grain structure

Table 8: Fladbury 1 association

Stoneless clayey soils and clay loam soils variably affected by groundwater. Flat land with risk of flooding.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 158 min 153)	Wetness class	Average moisture deficit and (available water) (mm)		ALC grade	ALC determinants
					Wheat	Potatoes		
Fladbury		River alluvium	156	III**	99 (130)	89 (110)	3b	Topsoil texture and wetness class
	Blithe*	River alluvium	156	III	99 (120)	89 (100)	3a	Topsoil texture and wetness class

* Blithe series of loamy alluvium over gravel is a localised inclusion in this association and found to be common on floodplains within the CFA.
** Locally WC IV.

Brief soil profile descriptions

Fladbury	Blithe
0-15cm Ahg: Dark greyish brown, mottled, stoneless clay	0-15cm Ahg: Dark greyish brown, mottled, stoneless medium clay loam
15-60cm Bg: Greyish brown, mottled, stoneless clay; strong coarse prismatic structure	15-60cm Bg: Greyish brown, mottled, stoneless medium clay loam; strong coarse prismatic structure
60-120cm Cg: Grey, mottled, stoneless clay; massive structure	60-80cm Cg: Grey, mottled, stoneless clay loam; massive structure
	80-120cm 2Cg: Brown or greyish brown, mottled, gravely loamy sand or sandy loam; single grain structure

3 Forestry

3.1.1 Identification of forestry resources has primarily had regard to the National Forestry Inventory[16].

3.1.2 The area of land under forestry (i.e. trees and woodland) within 2km either side of the route centre line has been determined using GIS and is shown in Table 9.

Table 9: Area of woodland within the study area and construction boundary

	Area of forestry land (ha)	Forestry land as a % of total land area
Forestry land in study area	100.8	5
Forestry land within construction boundary	10.4	4

3.1.3 Areas of woodland includes The Belt north of Coleshill Manor Office Campus, a plantation woodland belt adjacent to the Old Saltleians Rugby Football Club, and an area of secondary woodland and scrub near Jack O'Watton industrial estate, between the A446 Lichfield Road and the Birmingham and Derby Line. As forestry land covers 5% of land in the study area, compared to the national average of 10%, the sensitivity of the forestry land resource in this study area is considered to be 'high', as set out in the SMR Addendum (see Volume 5: Appendix CT-001-000/2).

[16] Forestry Commission (2001), National Forest Inventory Woodland and Ancient Woodland (as updated).

4 Assessment of effects on holdings

4.1.1 The effects on holdings have been assessed according to the methodology set out in the SMR Addendum (Volume 5: Appendix CT-001-000/2). The nature of impacts considered comprises the temporary and permanent land required from the holding, the temporary and permanent severance of land, the permanent loss of key farm infrastructure and the imposition of disruptive effects (particularly noise and dust) on land uses and the holding's operations. These impacts occur primarily during the construction phase of the Proposed Scheme.

Table 10: Summary of assessment of effect on holdings

Holding reference, name and description	**Construction effects**	**Residual effects post restoration of land**
CFA19/1 Land at Wheeley Moor Farm 149.7ha of mixed arable and livestock Medium sensitivity to change	Land required: 43.8ha; 29% of holding required for construction. High Impact Severance: see note under permanent Low Impact Disruptive effects: noise may affect horse livery and kennels Medium Impact	Land required: 23.4ha; 16% of holding taken. Medium Impact Severance: mitigated by access beneath M6 Motorway viaducts and access off B4144 Birmingham Road Low Impact Infrastructure: reconnection of drainage and drinking trough supply systems required; reconfiguration of access tracks; fencing and field boundaries Low Impact
CFA19/2 Windmill Farm 170.0ha of mixed arable and livestock Medium sensitivity to change	Land required: 39.2ha; 23% of holding required for construction. High Impact Severance: see note under permanent effects Medium Impact Disruptive effects: none identified Low Impact	Land required: 34.4ha; 20% of holding taken. High Impact Severance: severance mitigated by access beneath Coleshill and River Cole viaducts Medium Impact Infrastructure: reconnection of drainage and drinking trough supply systems; retention of outfall to receiving watercourse; reconfiguration of access tracks, particularly to maintain access beneath M6-M42 link; fencing; mitigation for loss of agricultural buildings Medium Impact
CFA19/3* Land around Coleshill Manor 88.5ha of arable Medium sensitivity to change	Land required: 29.4ha 33% of holding required for construction High Impact Severance: None Low Impact Disruptive effects: none identified Low Impact	Land required: 25.7ha; 29% of holding taken High Impact Severance: severance mitigated by access beneath Coleshill and River Cole viaducts, although right of access may need to be established over 3rd party land Low Impact Infrastructure: reconnection of drainage systems; reconfiguration of access tracks Low Impact

Holding reference, name and description	**Construction effects**	**Residual effects post restoration of land**
CFA19/5* Land off Gilson Drive and B4114 (Birmingham Road) 4.6ha of (grassland) Medium sensitivity to change	Land required: 3.3ha; 72% of holding required for construction High Impact Severance: none identified Negligible Impact Disruptive effects: none identified Low Impact	Land required: 1.5ha; 31% of holding taken. High Impact Severance: none identified Negligible Impact Infrastructure: reinstatement of access off roads; rationalisation of field boundaries; reconnection of drainage and field water supply system; fencing Negligible Impact
CFA19/6* Three land parcels at Gilson 55.1ha of livestock pasture (cattle and sheep) Medium sensitivity to change	Land required: 14.4ha; 26% of holding required for construction High Impact Severance: no severance identified Negligible Impact Disruptive effects: none Low Impact	Land required: 11.5ha; 21% of holding taken High Impact Severance: none, but note that whole of northern block required for ecological mitigation Negligible Impact Infrastructure: reinstatement of access off roads; reconnection of drainage and field water supply system; fencing Negligible Impact
CFA19/7 Land adjacent to Gilson 35.0ha of livestock pasture (cattle and sheep) Medium sensitivity to change	Land required : 20.2ha; 58% of holding required for construction High Impact Severance: Negligible Impact (severed land in construction zone) Disruptive effects: none identified Low Impact	Land required: 8.6ha; 25% of holding taken. High Impact Severance: severance mitigated by provision of access off A446 Medium Impact Infrastructure: provision of access off A446; reconnection of drainage and field water supply system; fencing Medium Impact
CFA19/8 Newlands Farm 93.1ha of mixed arable and livestock Medium sensitivity to change	Land required: 78.4ha; 84% of holding required for construction. Such a substantial proportion of the northern block required for construction that the farm enterprise is likely to become unviable. High Impact Severance: northern parcel (near Faraday Avenue) severed High Impact Disruptive effects: potential noise disruption to both stock and residences Medium Impact	Land required: 45.8ha; 49% of holding taken. Such a substantial proportion of the northern block required for the scheme that the farm enterprise is likely to become unviable. High Impact Severance: northern parcel (near Faraday Avenue) severed Medium Impact Infrastructure: severance of drainage systems; water supply systems; loss of farm infrastructure; access to southern parcel through urban area may restrict size of plant that can reach this part of holding Medium Impact

Holding reference, name and description	**Construction effects**	**Residual effects post restoration of land**
CFA19/9 Gilson Hall 25.9ha of livestock pasture (cattle and sheep) Medium sensitivity to change	Land required: 26.2ha; 100% of holding required for construction High Impact Severance: none Negligible Impact Disruptive effects: no dust or noise effects anticipated Low Impact	Land required: 14ha; 54% of holding taken. High Impact Severance: none Negligible Impact Infrastructure: access through urban area may restrict size of plant that can reach holding; drainage functionality needs reinstating (including outfall under M42-M6 toll link) water supply to field troughs needs reinstating; new gateway provision; fencing Negligible Impact
CFA19/10 Land lying on south of Vicarage Lane 1.5ha of woodland Medium sensitivity to change	Land required: 1.5ha; 92% of holding required for construction High Impact Severance: None Negligible Impact Disruptive effects: None Negligible Impact	Land required: 1.5ha; 92% of holding taken for ecological mitigation. Holding becomes unviable as an agricultural enterprise. High Impact Severance: N.A (see above) Negligible Impact Infrastructure: none (see above) Negligible Impact
CFA19/11 Land lying on southwest of Coleshill Road Water Orton 7.3ha of arable Medium sensitivity to change	Land required: 7.3ha; 100% of holding required for construction High Impact Severance: none Negligible Impact Disruptive effects: none identified Negligible Impact	Land required: 7.3ha; 100% of holding taken for ecological mitigation. Holding becomes unviable as an agricultural enterprise. High Impact Severance: N.A. (see above) Negligible Impact Infrastructure: N.A. (see above) Negligible Impact
CFA19/13* Land lying to the south of Gilson Road (desk study) 1.3ha of equestrian grazing Low sensitivity to change	Land required: 0.4ha; 32% of holding required for construction High Impact Severance: none Negligible Impact Disruptive effects: none identified Low Impact	Land required: oha; 0% of holding taken Negligible Impact Severance: none Negligible Impact Infrastructure: access off road may need to be reinstated Negligible Impact
CFA19/14* Land adjoining Grimstock Country House Hotel (desk study) 1.9ha of livestock pasture (cattle and sheep) Medium sensitivity to change	Land required: 0.1ha; 9% of holding required for construction Low Impact Severance: none Negligible Impact Disruptive effects: none identified Low Impact	Land required: oha; 0% of holding taken. Negligible Impact Severance: none Negligible Impact Infrastructure: access off road may need to be reinstated Negligible Impact

Holding reference, name and description	**Construction effects**	**Residual effects post restoration of land**
CFA19/15 Land lying to the south of Gilson Road (phone interview) 1.9ha of equestrian grazing (non commercial) Low sensitivity to change	Land required: 1.5ha; 82% of holding required for construction High Impact Severance: none Negligible Impact Disruptive effects: noise may affect horse livery Medium Impact	Land required: 1.5ha; 79% of holding taken. Holding likely to become unviable accommodation for horses High Impact Severance: N.A (see above) Negligible Impact Infrastructure: N.A (see above) Negligible Impact

* No farm impact assessment interview conducted; data estimated.

5 References

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